

Clean version of all pending claims

1-6. (Cancelled)

7. (Amended once) An apparatus comprising:

*Q1 Sub 7 B1*

a package substrate having top and bottom surface buildup layers disposed on a thermally conductive substrate core, wherein a portion of the substrate core is exposed at a top surface of the package substrate for attachment of a heat spreader.

8. The apparatus of claim 7, wherein the exposed portion of the substrate core extends around the perimeter of the top surface buildup layers.

9. The apparatus of claim 7, wherein the substrate core is made of metal.

10. An apparatus comprising:

*Q2 Sub 7 B2*

a package substrate having top and bottom surface buildup layers disposed on a thermally conductive substrate core;

an integrated circuit having a top surface and a backside surface, the integrated circuit mounted on a first surface of the package substrate with the top surface of the integrated circuit facing the package substrate; and

a heat spreader thermally connected to the substrate core, a bottom surface of the heat spreader thermally coupled to the backside surface of the integrated circuit.

11. The apparatus of claim 10, wherein the heat spreader is thermally coupled to a perimeter portion of the substrate core.

12. The apparatus of claim 10, wherein the heat spreader is soldered to the substrate core.
13. The apparatus of claim 10, wherein the heat spreader is made of metal.
14. The apparatus of claim 10, wherein the substrate core is made of metal.
15. The apparatus of claim 10, comprising a thermal interface material disposed between the backside surface of the integrated circuit and the bottom surface of the heat spreader.
16. The apparatus of claim 10, comprising a heat sink attached to a top surface of the heat spreader.
17. The apparatus of claim 16, comprising a fan attached to the heat sink.
18. The apparatus of claim 10, wherein the integrated circuit is mechanically and electrically coupled to the package substrate by a plurality of solder bump interconnections.
19. The apparatus of claim 18, comprising a printed circuit board, wherein the package substrate is mounted on the printed circuit board.
20. The apparatus of claim 19, wherein the package substrate is mechanically and electrically coupled to the printed circuit board by a plurality of solder bump interconnections.

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21. (Amended once) An apparatus comprising:

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a package substrate having top and bottom surface buildup layers disposed on a thermally conductive substrate core;

at least two integrated circuits having top surfaces and backside surfaces, the integrated circuits mounted on a first surface of the package substrate with the top surfaces of the integrated circuits facing the package substrate; and

a heat spreader thermally coupled to the substrate core, wherein a surface of the heat spreader is thermally connected to the backside surfaces of the at least two integrated circuits.

22. The apparatus of claim 21, comprising one or more capacitors mounted on a top surface of the package substrate.

23. The apparatus of claim 21, wherein the heat spreader is soldered to the substrate core.

#### REMARKS

Claims 7-8, 10-13, 15 and 18-20 have been rejected under 35 USC 102(b) as being anticipated by U.S. patent no. 6,118,177 ("Lischner").

Claims 9, 14 have been rejected under 35 USC 103(a) as being unpatentable over Lischner in view of U.S. patent no. 6,178,093 ("Bhatt").

Claims 16-17 have been rejected under 35 USC 103(a) as being unpatentable over Lischner in view of U.S. patent no. 6,229,204 ("Hembree").